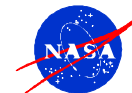




STATEMENT OF BASIS



HYDROCARBON BURN FACILITY (HBF) SOLID WASTE MANAGEMENT UNIT 7 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION KENNEDY SPACE CENTER BREVARD COUNTY, FLORIDA

PURPOSE OF STATEMENT OF BASIS

This Statement of Basis (SB) has been developed to inform and give the public an opportunity to comment on a proposed remedy to address contamination at the Hydrocarbon Burn Facility¹. A Kennedy Space Center (KSC) Remediation Team consisting of National Aeronautics and Space Administration (NASA) and Florida Department of Environmental Protection (FDEP) personnel has determined that the proposed remedy is cost effective and protective of human health and the environment. However, before implementing the proposed remedy, the KSC Remediation Team would like to provide the public an opportunity to comment on the proposed remedy. At any time during the public comment period, the public may comment as explained in the “How Do You Participate” section of this SB. After the end of the public comment period, the KSC Remediation Team will review all comments and issues raised in the comments and determine if there is a need to modify the proposed remedy prior to implementation.

WHY IS A REMEDY NEEDED?

The results of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) indicated that several volatile organic compounds (VOCs) listed in Table 1 are present in groundwater, which could be potentially harmful to human health if this water was used for human consumption now or in the future. In addition, the results of the RFI indicated that petroleum hydrocarbon compounds are present in the dissolved phase and as LNAPL. The petroleum hydrocarbon

The Cleanup Remedy

The proposed cleanup remedy for the HBF includes the following components:

- Completion of Interim Measure (IM) source removal [light, non-aqueous phase liquid (LNAPL) recovery]
- Monitoring Natural Attenuation (MNA) of the chlorinated ethene compounds of concern (COCs) and petroleum hydrocarbon plumes in the central and downgradient portions of the site. This will consist of groundwater monitoring to document water quality and contaminant levels.
- Implementation of institutional controls to prohibit the use of groundwater as a potable water supply.

1. In accordance with RCRA §7004(b), this Statement of Basis summarizes the proposed remedy for the NASA Hydrocarbon Burn Facility (HBF). For detailed information on the site, consult the HBF RFI and CMS Reports, which are available for review at the information repository located at the North Brevard Library, 2121 South Hopkins Avenue, Titusville, FL 32780, telephone: (321) 264-5026.

compounds present are highly weathered and have low viscosity, but could be potentially harmful to human health if groundwater is consumed. A Land Use Control Implementation Plan (LUCIP) will be developed to address potential risks associated with groundwater consumption.

HOW DO YOU PARTICIPATE?

The KSC Remediation Team solicits public review and comment on this SB before implementing the proposed remedy. The remedy for the HBF will eventually be incorporated into the Hazardous and Solid Waste Amendments (HSWA) Permit for KSC.

The public comment period for this SB and proposed remedy will begin on the date of publication for notice of availability of the SB in major local newspapers of general circulation, and end 45 days thereafter. If requested during the comment period, the KSC Remediation Team will hold a public meeting to respond to any oral comments or questions regarding the proposed remedy. To request a hearing or provide comments, contact the following person in writing within the 45-day comment period:

Mr. John R. Armstrong, P.G.
FDEP - Bureau of Waste Cleanup
2600 Blair Stone Road, MS 4535
Tallahassee, FL 32399-2400

The HSWA Permit, SB, and associated administrative file, including the CMS Report, will be available to the public for viewing and copying at:

NASA Document Library
North Brevard Library
2121 South Hopkins Avenue
Titusville, FL 32780
Telephone: (321) 264-5026

To request further information, you may contact one of the following people:

Mr. Harold Williams
Remediation Program Manager
Environmental Program Office
Mail Code: TA-C3
Kennedy Space Center, FL 32899
E-mail: harold.g.williams@nasa.gov
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Mr. John R. Armstrong, P.G.
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FACILITY DESCRIPTION

NASA established the KSC as the primary launch site for the space program. These operations have involved the use of toxic and hazardous materials. Under the RCRA and applicable HSWA permit (Permit No. FL6800014585) issued by the FDEP and/or United States Environmental Protection Agency (EPA), KSC was required to perform an investigation to determine the nature and extent of contamination from Solid Waste Management Unit (SWMU) No. 7, the HBF.

SITE DESCRIPTION AND HISTORY

The HBF is located on the eastern portion of KSC near the Banana River and occupies

the northwestern portion of the approximately 13-acre fire-fighting training facility within the KSC. The site location and plan maps are included as Figures 1 and 2, respectively. The HBF was operational between 1966 and 1994 during which time fire-fighting training activities required the use of conventional petroleum fuels mixed with volatile waste solvents and associated impurities. These fuels/solvents contained the COCs detected in the groundwater beneath the site. The infrastructure formerly present at the site was recently destroyed during IM source removal activities. LNAPL was detected following source removal activities and is being addressed through weekly collection events. If LNAPL remains at the end of 2004, a more aggressive remedial action will be implemented according to the IM source removal contingency plan.

Investigations conducted at the site include:

- 1992: An Initial Remedial Action (IRA) was completed to excavate hydrocarbon impacted soil from the former effluent disposal area.
- 1992: A Petroleum Contamination Assessment (CA) was performed and chlorinated solvents were identified in the groundwater.
- 1996: An RFI Screening Investigation was conducted. Initial soil and groundwater sampling was conducted. Additional tasks to further delineate detected hydrocarbon and chlorinated solvents were recommended.
- 1999: An RFI was conducted. Soil contaminated with excessive petroleum hydrocarbon compounds was reported.

Groundwater contamination was identified to include both a chlorinated ethene and dissolved petroleum hydrocarbon compounds plume. Results of the analyses were used to evaluate potential risks to human health and ecological receptors. The Human Health Risk Assessment (HHRA) indicated that groundwater containing chlorinated ethene compounds of concern (COCs) and petroleum hydrocarbon compounds would result in an unacceptable human health risk if the groundwater was used as a potable water source. The Ecological Risk Assessment (ERA) indicated that unacceptable risks associated with polychlorinated biphenyls (PCBs) and metals in the soil were present.

- 1999: An IM was conducted for removal of buried drums/metal containers and soil sampling indicated that the soil beneath the drums/metal containers had not been impacted.
- 2003: An IM source removal was conducted. Activities included the demolition of the on-site infrastructure, excavation of chlorinated ethene impacted soils, excavation of PCBs, metals and petroleum contaminated soils, and removal of LNAPL and the treatment of impacted groundwater during the excavation activities. Remediation enhancement additives were emplaced in the excavations and excavation areas were backfilled with clean fill material to original grade.
- 2003: A Microcosm Study was conducted. Samples of the groundwater and sediment from the wetlands area were collected and characterized to test the ability of the wetland's sediments and

water to support both anaerobic and aerobic biodegradation of the chlorinated ethene COCs. The results of the anaerobic microcosm tests provided concrete microbial evidence for the biodegradation of chlorinated ethene by reductive dechlorination mechanisms. The results of the aerobic microcosms showed no significant difference between the aerobic microcosm treatments and the abiotic control.

- 2003: A Phytoremediation Study was performed. Plant tissue samples were collected in two separate sampling events. One event took place during the growing season (summer) and the other one occurred during the dormant season (winter). Results of the study indicated that the natural vegetation in the wetlands area enhances the attenuation of chlorinated ethene COCs and petroleum hydrocarbon compounds. Since the COC source areas were removed during the IM activities, it was concluded that the combination of enhanced natural attenuation and phytoremediation should allow for a cost-effective method to reach groundwater cleanup goals on the site within a reasonable time.

SUMMARY OF SITE RISK

As part of the RFI activities, risk assessments were completed in accordance with KSC's Remediation Team Risk Assessment Decision Process Document (DPD). The ERA was performed in accordance with the eight-step process described in the EPA's "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments," dated 1997.

Groundwater COCs identified for human health during the RFI included several VOCs associated with a chlorinated ethene plume. Several PAHs and metals were identified as soil COCs but were eliminated following the 2003 IM source removal. For a complete list of groundwater COCs, see Table 1.

The HHRA showed that total lifetime cancer risks above 10^{-4} were revealed for the future industrial worker and future hypothetical resident if, and only if, site groundwater is used as a potable water source. The main contaminants contributing to the cancer risk were chlorinated ethene compounds such as trichloroethylene (TCE), the dichloroethene isomers (DCE) and vinyl chloride (VC).

WHAT ARE THE REMEDY OBJECTIVE(S) AND LEVELS?

The remedial action objective (RAO) is to protect humans from exposure to groundwater by preventing its use as a drinking water source in the shallow aquifer where contaminant concentrations are higher than FDEP/EPA cleanup target levels, and by implementing groundwater cleanup. Table 1 lists the COCs present in groundwater at the HBF. The first column lists the chemical name, the second column lists the range of detections from the more recent sampling activities, and the last column presents the FDEP/EPA cleanup target level to be achieved at the site.

Table 1

Site-Related Chemicals of Concern (COCs)	Range of Detections ¹ (µg/L)	Site-Specific Cleanup Level ² (µg/L)
Trichloroethene	1.2 - 11,800	3
Cis-1,2-dichloroethene	5.8 - 18,000	70
Trans-1,2-dichloroethene	0.84J - 70	100
Vinyl Chloride	0.99 - 4,930	1
Benzene	0.54J - 39	1
Chloroethane	2.1J - 87.3	12
1,1-Dichloroethane	0.83J - 395	70
1,1-Dichloroethene	0.76J - 138	7
Ethylbenzene	0.44J - 97	30
Toluene	0.51J - 866	40
Xylenes (Total)	1.5J - 907	20

µg/L = micrograms per liter

¹ Results of monitoring well groundwater samples analyzed from 2001 to 2004.

² Cleanup levels are Groundwater Cleanup Target Levels (GCTLs) from Florida Administrative Code 62-777.

REMEDIAL ALTERNATIVES FOR THE HBF

Remedial alternatives are different combinations of plans or technologies to restrict access, and to contain or treat contamination to protect human health and the environment. Several alternatives were considered for the HBF, as summarized below.

Groundwater - Chlorinated Ethene COCs and Petroleum Hydrocarbon Contaminants:

- Presumptive Remedies
 - Extract petroleum hydrocarbon compounds in LNAPL in the vicinity of the large and small hydrocarbon burn pans.
- Proven Alternative Technologies
 - Air-sparge with Vapor Extraction

(AS/VE) in source area and MNA in downgradient plume area

- Groundwater Capture and Treatment in source area and MNA in downgradient plume area

- Innovative Technology
 - Bio-Reduction/Oxidation via Hydrogen Release Compounds (HRC™) and/or Oxygen Release Compounds (ORC®) in source area and MNA in downgradient plume area
- Passive Remedies
 - MNA/Long-term Monitoring
 - Land Use Controls (LUCs)

Several potentially applicable corrective measures for dissolved phase contamination at the HBF were identified and screened in the Corrective Measures Study (CMS). Detailed information was presented concerning each potentially applicable corrective measure for contaminated groundwater.

EVALUATION OF REMEDIES

The various remedial alternatives were evaluated to determine if they will comply with EPA's four threshold criteria and five balancing criteria for corrective measures. The four threshold criteria for corrective measures are:

- overall protection of human health and the environment;
- attain media cleanup standards;
- control the sources of releases; and
- comply with standards for management of wastes.

The five balancing criteria are:

- long-term reliability and effectiveness;
- short-term effectiveness;
- reduction in the toxicity, mobility, and volume of wastes;
- implementability; and
- cost.

MNA with long-term monitoring and LUCs meet each of the threshold criteria and were determined by the KSC Remediation Team to be the best overall approach considering the balancing criteria.

FINAL REMEDY

The final corrective measure for groundwater contaminated with chlorinated ethene COCs and LNAPL at the HBF is MNA and LNAPL removal. This remedy will involve long-term groundwater monitoring.

LNAPL Recovery. LNAPL collection events are currently being conducted at the HBF, and consist of pumping of LNAPL from selected piezometers/wells on a weekly

basis. These LNAPL collection activities will continue through year 2004. If LNAPL remains in significant quantities after completion of the initial recovery events, more aggressive LNAPL remedial efforts will be performed.

MNA and LUCs. Natural processes such as biological degradation, dispersion, advection, and adsorption will reduce COC concentrations to cleanup levels over time. Groundwater will be regularly sampled and analyzed to monitor and document the decrease in contaminant concentrations. Data collected during the RFI, CMS, the Microcosm Study and the Phytoremediation Study indicated that natural attenuation mechanisms will likely reduce contaminant concentrations below cleanup levels. The RAO will be achieved using long term groundwater monitoring. The effectiveness of the remedy will be evaluated to determine if the remedy is effective or if implementation of additional corrective measures are necessary.

Institutional controls will also be implemented for site groundwater. The institutional controls will prohibit the use of groundwater as a potable water supply.

NASA, EPA, and FDEP have entered into a Memorandum of Agreement (MOA), which outlines how institutional controls will be managed at NASA². The MOA requires periodic inspections, condition certification,

2. By separate MOA effective February 23, 2001, with the EPA and FDEP, KSC, on behalf of NASA, agreed to implement Center-wide, certain periodic site inspections, condition certification, and agency notification procedures designed to ensure the maintenance by Center personnel of any site-specific LUCs deemed necessary for future protection of human health and the environment. A fundamental premise underlying execution of that agreement was that through the Center's substantial good faith compliance with the procedures called for herein, reasonable assurances would be provided to EPA and FDEP as to the permanency of those remedies which included the use of specific LUCs.

Although the terms and conditions of the MOA are not specifically incorporated or made enforceable herein by reference, it is understood and agreed by NASA KSC, EPA and FDEP that the contemplated permanence of the remedy reflected herein shall be dependent upon the Center's substantial good faith compliance with the specific LUC maintenance commitments reflected herein. Should such compliance not occur or should the MOA be terminated, it is understood that the protectiveness of the remedy concurred in may be reconsidered and that additional measures may need to be taken to adequately ensure necessary future protection of human health and the environment.

and agency notification. The area of the site that will be under institutional control is shown on Figure 2.

WHAT IMPACTS WOULD THE REMEDY HAVE ON THE LOCAL COMMUNITY?

There would be no impacts to the local community because groundwater is not used for potable water at KSC. The alternatives selected include administrative actions to limit the use of groundwater until the cleanup levels have been reached. Long-term groundwater monitoring will be used to monitor and document reduction in contaminant concentrations to cleanup target levels. Institutional controls will also prevent exposure to contaminants prior to cleanup levels being achieved.

WHY DOES THE KSC REMEDIATION TEAM RECOMMEND THIS REMEDY?

The team recommends the proposed remedy because the remedies selected are cost effective means to remediate/control groundwater in a reasonable amount of time. The long-term monitoring will be used to monitor and document reduction in contamination concentrations to the cleanup target levels. The institutional controls will also prevent exposure to contaminants prior to the cleanup levels being achieved. The proposed remedy meets the four general standards for corrective measures and was determined to be the best overall approach.

NEXT STEPS

The KSC Remediation Team will review all comments on this SB to determine if the proposed remedy needs modification prior to implementation and prior to incorporating the proposed remedy into KSC's HSWA

permit. If the proposed remedy is determined to be appropriate for implementation, then corrective measures will be implemented, including long-term monitoring and a LUCIP to incorporate the institutional controls at this site.

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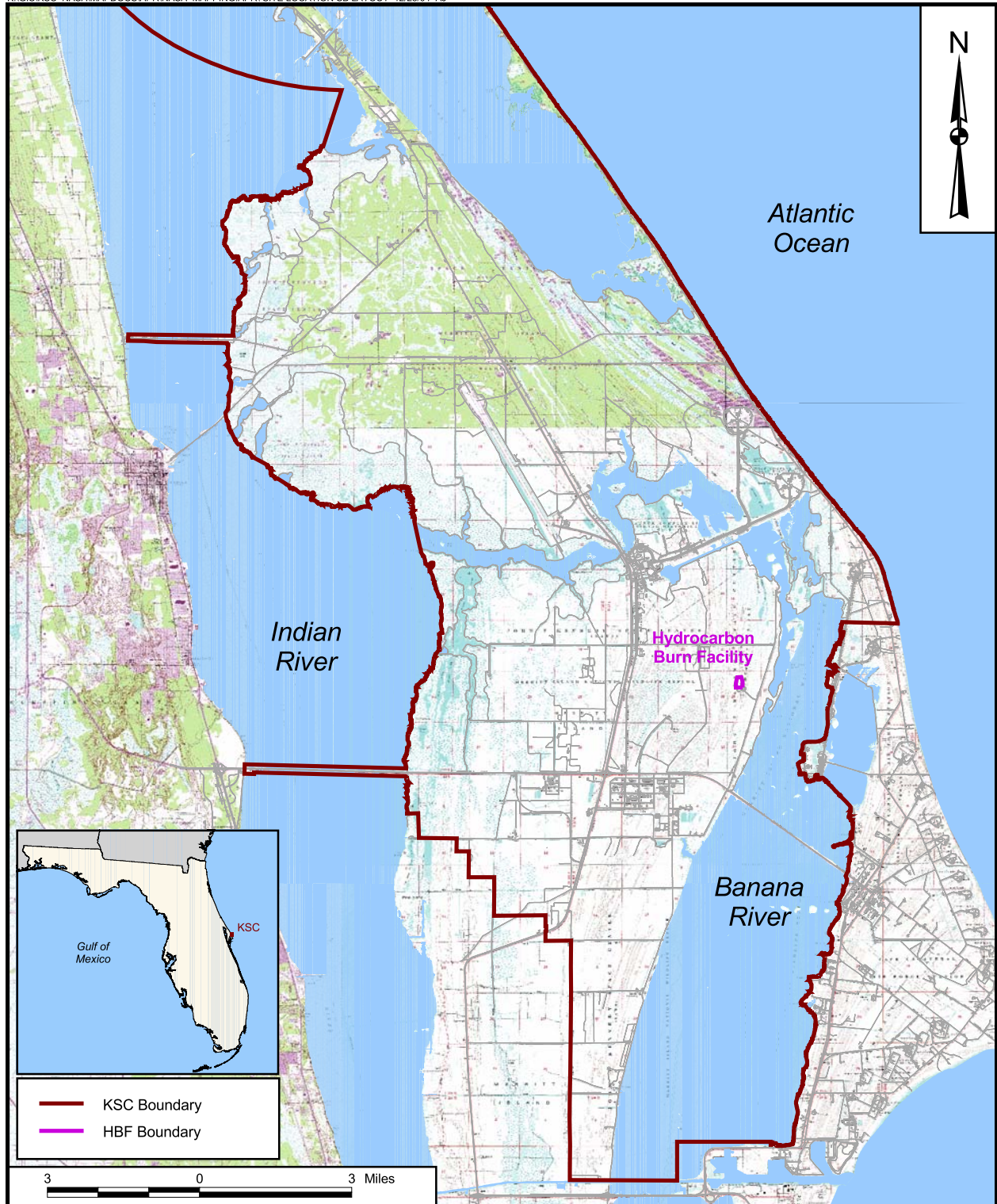


FIGURE 1
LOCATION OF HYDROCARBON BURN FACILITY
AT KENNEDY SPACE CENTER

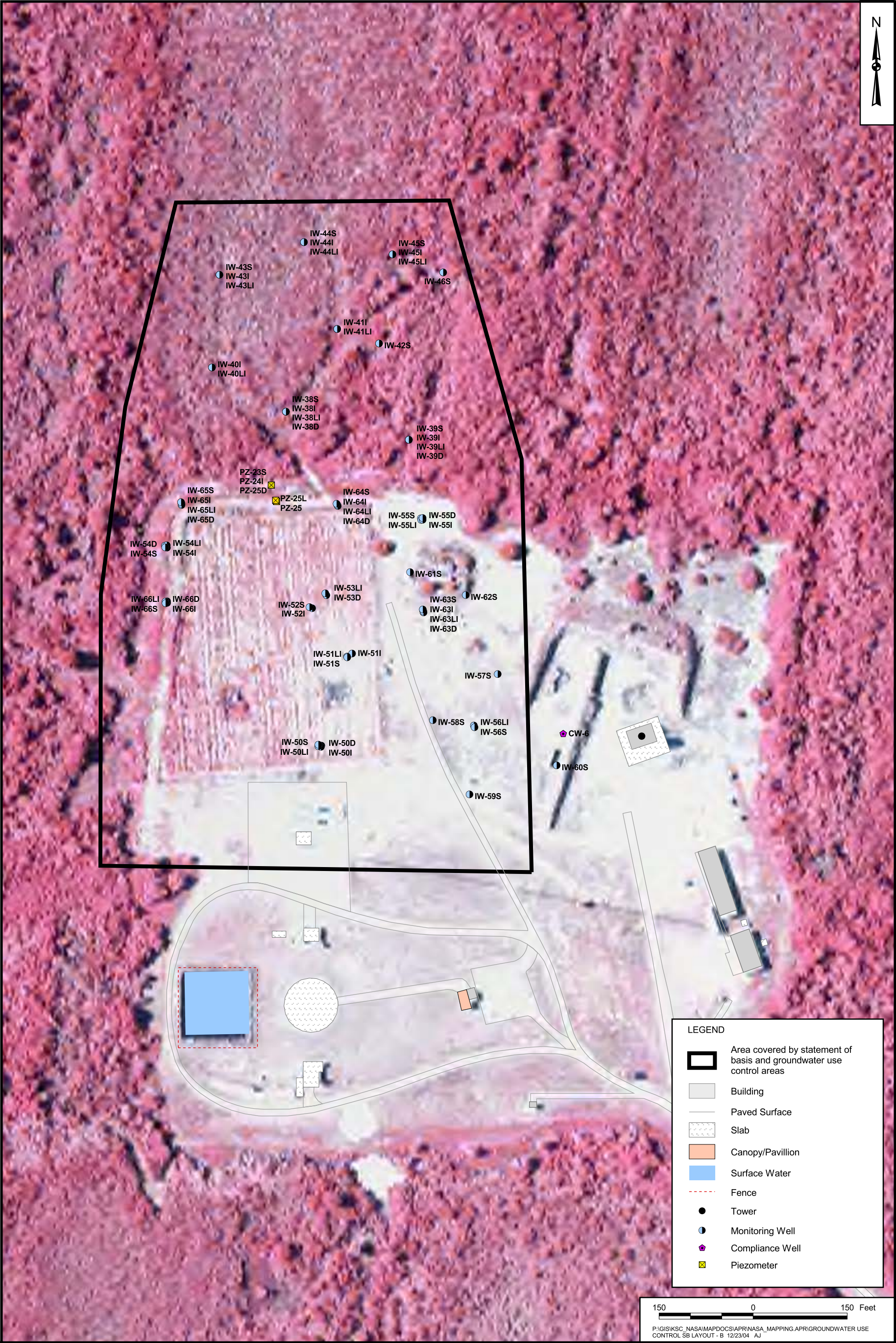


FIGURE 2
SITE MAP OF HYDROCARBON BURN FACILITY
AT KENNEDY SPACE CENTER